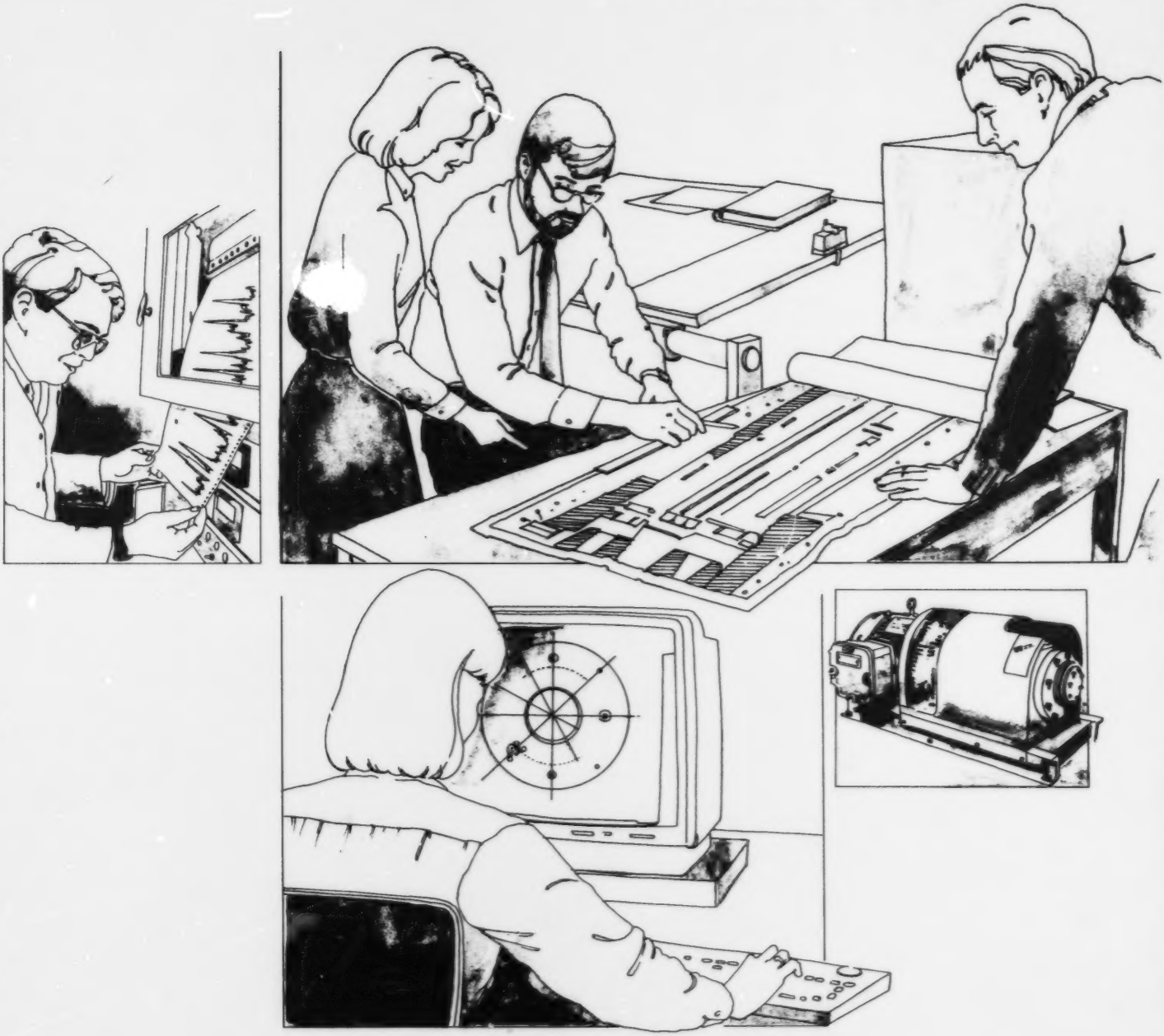
Nova Scotia Research Foundation Corporation 1988/89 Annual Report



TECHNOLOGY IN ACTION

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Corporate Profile

Nova Scotia Research was established in 1946 by the Province of Nova Scotia to use science and technology to assist in the economic development of Nova Scotia.

Three operating divisions — Applied Science, Industry Services and Product Development — carry out technical assignments for 700 companies and government departments each year.

The Corporation pursues two main goals — assistance to industry in the solution of today's technical problems and product/process innovation in anticipation of tomorrow's opportunities.

APPLIED SCIENCE

Technical services and applied R&D for industry and government.

Laboratory Services

Analytical and Environmental Chemistry

- ☐ Lube oil and fuels analysis
- ☐ Characterization of metals and organics
- ☐ Pressure-treated wood quality control
- ☐ Monitoring asbestos removal
- ☐ Indoor air-quality monitoring
- ☐ Glassblowing

Biology

- ☐ Microbiological analysis
- ☐ Food quality and sanitation surveys

Materials

- ☐ Mechanical and metallurgical testing
- ☐ Welding procedure qualifications
- ☐ Failure analysis
- ☐ Corrosion analysis

Research and Development

Coal and Mineral Technology

- ☐ Process development and economic studies
- ☐ Coal liquefaction R&D
- ☐ Spray testing and rheology studies
- ☐ Mineral utilization and industrial waste management

Biology

- ☐ Symbiotic plant-microbe interactions
- ☐ Plant tissue culture
- ☐ Fish freshness test development

Geophysics

- ☐ Marine and ground geophysical surveys
- ☐ Borehole geophysical logging
- ☐ Data compilation, processing and interpretation
- ☐ Geophysical equipment development

Materials R&D

- ☐ Ceramics
- ☐ Corrosion

INDUSTRY SERVICES

Technical assistance to small and medium-sized manufacturers to improve productivity and technological capabilities.

Field Service

- ☐ National Research Council's IRAP Program
- ☐ Technical information/literature searches
- ☐ In-plant problem solving
- ☐ Technology transfer/acquisition
- ☐ Technology patent searches

Technical People in Industry Program

- ☐ Financial support for new skills to industry

Project Services

- ☐ Technical/market analysis
- ☐ Fisheries engineering
- ☐ Bio resource machine applications engineering
- ☐ Mathematics and computer applications

Library

- ☐ Computer database searches
- ☐ Technical searches

PRODUCT DEVELOPMENT

New Product Development

- ☐ Engineering
- ☐ Manufacturing
- ☐ Marketing
- ☐ Mechanical/electronic engineering and design assistance
- ☐ CAD/CAM familiarization

Export Sales

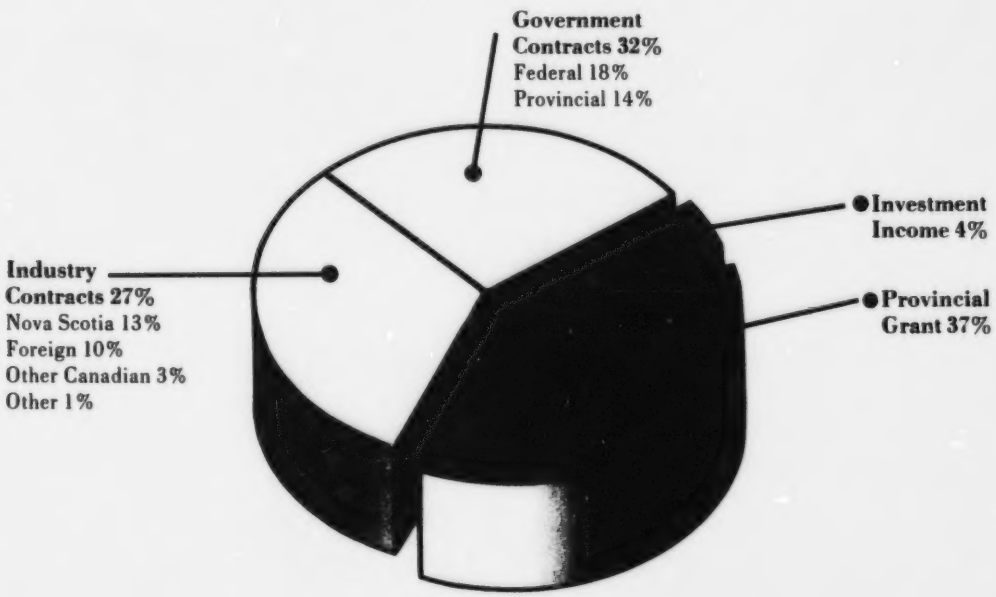
- ☐ Diving life-support equipment
- ☐ Geophysical marine equipment
- ☐ Underwater instrumentation
- ☐ Magnetically coupled "zero leakage" blowers and pumps

Accident Reconstruction

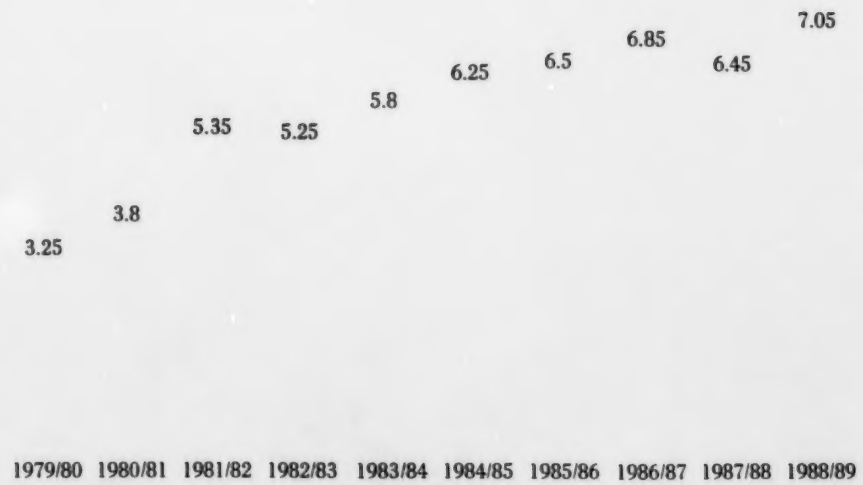
FINANCIAL SUMMARY

	1989	1988
Revenue		
Scientific and Engineering Contracts	**$4,158,092**	$3,840,421
Grant from Province of Nova Scotia	**2,582,500**	2,516,900
Investment Income	**308,591**	168,075
Expenses		
Science and Engineering	**5,483,820**	5,350,573
Administration and Occupancy	**1,564,143**	1,161,692
Net Income (Loss)	**1,220**	13,131

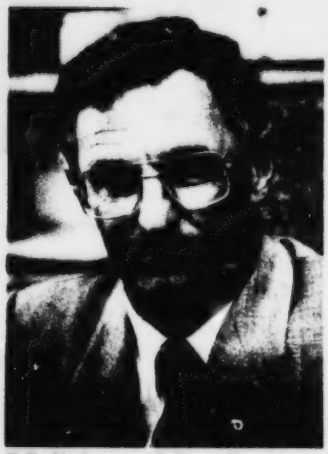
Source of Revenue 1988/89



Ten Year Revenue Summary
Millions of Dollars



President's Report



T.B. Nickerson, P.Eng., President

Last year I noted that federal laboratories and the universities accounted for the major part of science and technology (S&T) activity in the Province; hence the need to forge linkages to ensure that these public sector S&T assets contribute to industrial and economic development in Nova Scotia. This issue was a priority for the Nova Scotia Research Foundation Corporation during the past year and I am pleased to report excellent progress.

The Corporation signed Memoranda of Understanding with seven Nova Scotia universities during the year. These agreements make academic expertise more readily available to the Corporation in support of industry needs, and encourage university faculty to join the Corporation and industry in R&D projects closely related to economic opportunities in Nova Scotia. The coordinating committees established under the agreements are considering several potentially fruitful projects.

A new Technical People In Industry program began operations in January 1989 with financial support from the Atlantic Canada Opportunities Agency (ACOA). This program helps small companies hire recent graduates in science, engineering or technology to work on specific technical projects. In addition to supporting part of the first-year salary, the program links the recent graduate and the company with a member of the S&T community who acts as an advisor for the project. In the first three months the program assisted 8 companies to hire S&T graduates. Over three years we expect to assist 75 new technical positions in Nova Scotia industry.

The Research Foundation licensed its rotary product technology to Focal Technologies Inc., a Dartmouth company specializing in fibre optics. Four NSRFC personnel moved to Focal as part of the technology transfer process. At its present rate the company will achieve its target of over $500,000 in sales of rotary products in the first year of the agreement.

Nova Scotia has a major medical R&D activity which has contributed significantly to health education and health care. These S&T assets have not, however, contributed significantly to economic development. The Corporation is evaluating its possible role in helping to stimulate more economic activity based on the research results and inventions of Nova Scotia's medical R&D community.

With financial support from both ACOA and the Province of Nova Scotia, the Research Foundation is establishing a centre for testing products under extreme environmental conditions. The facility will provide companies throughout Atlantic Canada with ready access to the test capabilities needed to develop and qualify products to meet aerospace, industrial, consumer and military standards. We plan to open the test centre in its new building by March 1990.

The Provincial Government's commitment to science and technology was reinforced in the past year. In the February 23, 1989 Throne Speech the government announced the establishment of a Nova Scotia First Fund to:

- ☐ support science and technology
- ☐ encourage development of high technology industries
- ☐ adapt new technologies to existing industries
- ☐ encourage innovation

The government followed up this announcement by providing the Nova Scotia Research Foundation with $10,000,000 as the first instalment of the Nova Scotia First Fund. A provincial technology strategy, providing a framework for investments by the fund, will be an integral part of the provincial economic development strategy which is currently being updated to reflect the challenges and opportunities in the 1990's.

The National Research Council's Industrial Research Assistance Program (IRAP) continues to effectively diffuse technology to industry. Nova Scotia Research, a participant in the NRC IRAP program for 37 years, has 8 industrial technology advisors who last year made 1,822 industry visits. We would like the story of IRAP's long-term major contribution to Nova Scotia industry (and thus its economy, which affects us all) to be better known. To this end we are featuring IRAP in the centre spread of this annual report.

The Corporation carried out 2,600 technical assignments and contracts for 630 clients in the past year, a growth of 9% over the previous year. Technical highlights included a significant advance in two-stage coal liquefaction technology through improved catalyst performance, completion of a major study of seabed conditions in the Gulf of Maine as part of the proposed submarine power cable route from Nova Scotia to New England, the granting of patents related to thin film mixing and advanced magnetic couplings, and the previously mentioned transfer of our rotary products technology.

The Corporation's revenues increased by 5.5% over the previous year to $7,063,043. The net income of $1,220 truly reflects the not-for-profit nature of the Corporation.

As reflected in the Corporate Profile (inside front cover), we have reorganized the Applied Science Division to group the various scientific disciplines into two units — Laboratory Services and Research and Development.

The basis of our continuing success is outstanding people — the staff and Board of Directors of the Corporation. Thank you for your dedication, hard work and support. I would particularly like to acknowledge the contributions of Dr. Bill Ford and Mr. Bill MacLennan, who retired from the Board this year after many years of dedicated service to the Corporation.

The 1990's promise to be a decade in which the level of technology and information will become even stronger determinants of economic growth. The Corporation is stronger than ever with its new linkages to public-sector science and technology. We are well positioned to assist a broad range of industry and government clients with the technology and information services appropriate to their needs. We approach with excitement the challenges and opportunities of the final decade of a remarkable century.

The Honourable
Donald Cameron
Minister
Department of Industry, Trade and Technology
Province of Nova Scotia
Halifax, Nova Scotia

Sir:

I have the honour of submitting the forty-second Annual Report of the Nova Scotia Research Foundation Corporation.

Respectfully yours,

T.B. Nickerson, P. Eng.
President
Nova Scotia Research Foundation Corporation
Dartmouth, Nova Scotia
September 1, 1989

"NSRFC's understanding of the urgent nature of our request and provision of the transducer helped us fill a contractual commitment."

G. Andrew Power
Martime Manager
McElhanney Services Ltd.

Analytical & Environmental Chemistry

The Analytical Chemistry Section continued to provide a wide range of technical support to Nova Scotia industry and government. Demand was especially high for chemical analysis of waste oils in process effluents and transformer oils for PCBs. The Section also analyzed lubricating oils (our lab is accredited by the Standards Council of Canada), fishmeal, well water, sludges, metals and pressure-treated wood products.

An increased number of industrial clients called upon the Environmental Chemistry Section to measure asbestos fibres in workplace air. Several projects to measure the air quality in offices were completed in cooperation with the Microbiology Section. We continued to assist Acres International Limited in the analysis of sludge from the Sydney Tar Ponds in preparation for incineration of this material.

The Section completed a market study for the fish quality analyzer, but no further field trials were conducted. We are seeking financial support for the development of a pre-production prototype.

Biology

The Biology Section continued its mycorrhizal fungi research program. These fungi form symbiotic associations with the roots of forest trees and agricultural crops. Research funded under the Federal/Provincial Agriculture Agreement has shown that manipulation of mycorrhizal associations may help strawberry growers to produce better plants. Similarly, our work for the Canadian Forestry Service explored methods of applying mycorrhizal fungi to forest tree seedlings. This treatment is expected to improve growth and survival of seedlings after outplanting and is presently being tested under field conditions.

Bacteria play a major role in the spoilage of fish. Conventional tests of the degree of bacterial spoilage are slow and hence often of limited practical value. To provide the fishing industry with a fast fish quality test we evaluated the Limulus Amoebocyte Lysate (LAL) test which can provide an indication of bacterial spoilage in less than one hour. The test compared favourably with standard methods currently in use.

Microbiological services for clients in industry and government included examinations for various bacteria, yeasts and molds in water, air, food products and industrial materials. As interest in preventative and quality-control applications continues to grow, the service not only conducts sanitation surveys of processing plants and food establishments, but gives background aid in problem-solving as well.

Coal and Mineral Technology

This section focuses on new and better uses for coal and mineral resources through the application of advanced and emerging technologies. We consider the environmental aspects of all process technologies under study.

Pilot testing continued on advanced two-stage direct liquefaction of Sydney area coals. Through process design changes we achieved unprecedented stability in product yield and quality with harbour seam coal in a 20-day continuous run. The test results were used to evaluate the economic potential of building a commercial plant in Nova Scotia.

Catalyst regeneration studies also began during the past year, funded by the Federal Department of Energy, Mines and Resources, the Nova Scotia Department of Mines and Energy and the Canada-Nova Scotia Agreement on Oil Substitution and Conservation.

Work continued on coal-water fuel (CWF) to support the R&D programs of the Cape Breton Development Corporation and Energy, Mines and Resources Canada. Numerous atomization tests were carried out to examine the influence of chemical additives in the fuel on the atomization of CWF. The section recently completed a project to characterize the ash generated from the combustion of CWF in an industrial steam-generating boiler.

A preliminary feasibility study on the production of barium chemicals entered its second phase under contract with Conwest Exploration Company Limited. Phase Two centres on laboratory tests to assess the technical feasibility of converting Lake Ainslie barite into high grade barium chemicals.

Geophysics

The Geophysics Section carried out a number of offshore marine surveys with the NSRFC Deep Tow Sparker System. Oil companies commissioned rig site surveys on the Scotian Shelf and the Grand Banks. A further study defined bottom sediments in Placentia Bay for the assembly area of the Hibernia oil field concrete production platform.

The largest survey formed part of the preliminary underwater route investigation for the proposed power cable across the Gulf of Maine. The acquisition, compilation and interpretation of data for the underwater cable (Project Bluenose) was completed in the early part of the year.

Inshore marine surveys included an investigation of sediments in the Minas Basin and a bathymetric and geophysical study for water intake and outfall pipes of a Cape Breton power station.

Gravity surveys were completed in Nova Scotia and New Brunswick and the data processed and interpreted. A gravity profile across the Cumberland Sub-Basin in northern Nova Scotia was interpreted using computer models.

Borehole geophysical surveys were completed for town water departments in Nova Scotia, for the Nova Scotia Department of Mines and Energy (coal investigation program) and for the government of New Brunswick (hydrogeological data-gathering).

Industry Services

Field Service

The Field Service is the gateway for Nova Scotia's industry to the resources provided by NSRFC, National Research Council (NRC) and many other organizations. The NRC Industrial Research Assistance Program (IRAP) provides access to technical know-how and expertise across Canada and around the world. In addition to direct technical assistance, the IRAP Field Service makes referrals to technical and scientific expertise and can tap IRAP funding assistance programs tailored to a variety of needs. (See feature in centre spread.)

The NRC's IRAP program supports eight engineers and the Province one. While concentrated at the Dartmouth main laboratory, these engineers also staff field offices in Sydney, Truro and Wolfville. The Wolfville office at Acadia University opened at the beginning of the year and has found excellent acceptance by local industry and the university itself. During the year our field staff made 1,822 visits to clients, answered more than 3,700 inquiries and carried out 55 in-depth technical projects. Funding assistance for Nova Scotia companies from IRAP and the Technology Inflow Program (TIP) last year amounted to approximately $1.5 million for 250 projects.

Project Services

The past year's work has included technical/marketing feasibility studies for a number of proposed new products or businesses, for example, an innovative electric motor monitoring device, metal building components manufacturing, potential products from Nova Scotia resources and computer assistance to the NRC IRAP program and field offices.

For the Atlantic Farm Mechanization Institute, we furthered the development of fiddlehead cleaning equipment, evaluated the performance of straw mulching machinery and tested forage equipment.

We provided marketing assistance on a long-term basis to Halifax County's Aerotech Park at the Halifax Airport, and technical assistance to Enterprise Cape Breton for their ongoing industrial development activities.

Technical People In Industry

To transfer technology into a company or to improve its existing technology some in-house technical expertise is needed. However, over 70% of small Nova Scotia manufacturers do not have a scientist, engineer or technologist on staff.

ACOA (Atlantic Canada Opportunities Agency) has accepted our proposal to demonstrate the positive impact of new technical skills in the smaller company. The program subsidizes salaries of engineers, scientists and technologists at up to 75% for six months with a possible further six months at 50%, depending on the projects. The technical expert's work must be new to the company and would demonstrate to management the use and advantage of having technical people on staff. The program also provides for a supervisor who is a link to the science and technology community. Formally begun on January 1, 1989, by the end of March the program had provided five companies with $57,710 in salary assistance for technical experts in:

- ☐ plant propagation
- ☐ agricultural products processing
- ☐ agricultural equipment performance
- ☐ technology transfer of electronic engineering
- ☐ technology transfer of numerically controlled, computer numerically controlled (NC/CNC) design and manufacturing

Materials

This year saw the completion of work on unisize submicron ceramic powders under the Space Station User Development Program. There are interesting potential applications in the private sector for our production process for these specialized substances.

We continued to work on the underwater explosive bulge testing of submarine hull plates and have worked with a private company to help it perform those tests at their location. Other work has included:

- ☐ failure analysis of the tow rope used on the Rowan Gorilla
- ☐ a number of fire investigations for insurance and other companies
- ☐ inspection of damages caused by muriatic acid gases; recommendation of treatment to stop the damages to property
- ☐ selection of corrosion-resistant and solderable wire material
- ☐ determination of causes of electric switch corrosion

Library

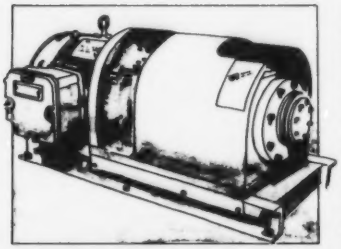
Our Library assists NSRFC staff and the technical public to obtain scientific and technical information. In addition to providing a collection of approximately 20,000 books, journals and reports, we maintain very active interlibrary loan relationships and have access to over 400 databases on eight systems.

"The technical-economic analysis provided by NSRFC staff has played a vital role in planning an expansion of the firm's operation."

Dennis Barnhill
Barnhill Forest Products Limited

"The Product Development Division solved a major problem for us in our Air Jack wireless transmitter. What they achieved may well be the 'make' in a 'make or break' situation."

Rick Davis, President
Air Jack Wireless Systems Inc.



The Division's operations encompass design, development, engineering, manufacturing, quality assurance and marketing. The objective is the commercial development of technology and transfer of the developed products to the private sector in Nova Scotia. The experience the Division has gained in this area is used to provide specialized service to Nova Scotia industry in new product development, problem-solving and implementation of CAD/CAM and quality assurance.

The Division changed markedly in the past year with the transfer, under license, of our entire rotary product line (electrical slip rings, fluid rotary unions and fibre optic rotary joints) to Focal Technologies Inc. of Dartmouth. Focal assumed full production and marketing of this product line on September 6, 1988.

Major technology transfers of this type require that the people vested with the technology move with the products. Four key members of the Division, embodying expertise in marketing, manufacturing, production control and assembly, left our employ and transferred to Focal. In addition, two other staff members assisted Focal with staff training on a term basis. Both Focal and NSRFC received partial financial support in this activity through the Canada-Nova Scotia Technology Transfer Subsidiary Agreement.

Now the Division has greater resources to focus on its other product line — magnetically coupled blowers and pumps — and is accelerating its efforts to commercialize that technology and transfer it to the private sector. In addition the Product Development Division has increased its service activity through increased Nova Scotia industry contracts and IRAP assistance work.

Two major new initiatives were launched by Product Development this year:

- ☐ the establishment of an Environmental Test Centre at NSRFC, and
- ☐ undertaking a feasibility study of a Medical Devices Development Centre.

The Environmental Test Centre will provide a common-user test facility for Maritime industry. It will allow companies to test their materials and products under a wide range of environmental stresses such as shock, vibration, temperature, pressure, altitude, humidity, rain, sand and dust, tension, fatigue, etc. As the first such facility in Atlantic Canada, the Environmental Test Centre will greatly assist Maritime manufacturing companies competing for government and commercial contracts that require environmental proving.

ACOA is providing $2.05 million for Test Centre equipment and the Province has contributed $460,000 for a new building to house the Centre.

The Medical Device Development Centre Study, currently underway, is examining the possibility of commercializing the fruits of the extensive medical research conducted in the area. The study is 75% funded by ACOA, with NSRFC providing the balance. NSRFC believes that there is an interesting opportunity to work synergistically with the research community and the private sector to create a medical device industry in the Province.

Product Development has a successful case study behind it already — contribution to development of a blood velocimeter using lasers and fibre optics. The Dalhousie University and Victoria General Hospital researchers involved have founded Pathfinder Med Limited to manufacture the new velocimeter. We hope the Medical Device Development Centre Study will show that this step from research to manufacture and marketing can be an often-repeated event, to the economic benefit of the Province.

Product Development has also taken a new step in joining Spectrum Technologies Incorporated, a marketing consortium of a number of small local high-tech companies. Spectrum companies market their resources collectively in Ottawa in order to attract projects to Nova Scotia that are larger or more multi-faceted than one firm could carry out. The combined strength of the consortium represents close to 130 engineers, scientists and technologists. The consortium presently includes the Product Development Division of NSRFC, the Applied Microelectronics Institute, Martec, Seimac, Ocean Routes Canada, Cabco and Seastar, with others pending.

The quality, reliability and good reputation of our own products speaks well for our Quality Assurance program. We have continued to assist Nova Scotia companies in assessing and implementing their own quality assurance programs.

IRAP AND THE FIELD SERVICE

Imagine post-War Canada, its industrial base swollen by the war effort. It has grown dramatically in size to produce huge quantities of goods but the technological level has not advanced as rapidly. Furthermore, many of the advances in science and technology were applied to war but their peacetime applications are still unexploited.

The Industrial Research Assistance Program's forerunner, the Technical Information Service, was founded in 1948 to provide direct technical advisory assistance to Canada's industrial base, and that concept is still in successful practice today. The National Research Council (NRC), parent organization of the Industrial Research Assistance Program (IRAP), contracted out the Nova Scotia operations to NSRFC in 1953. We have been an active member of the IRAP network since that date.

The IRAP program is operated by NRC in Ottawa. Provincial Coordinators organize the delivery of services and act as a liaison with Ottawa.

In each province there are a number of networks supplying people and resources. In Nova Scotia, in addition to the National Research Council and the Nova Scotia Research Foundation, the Association of Consulting Engineers of Canada, the Canadian Institute of Fisheries Technology, the Applied Microelectronics Institute, the Nova Scotia CAD/CAM Centre and the Canadian Construction Association are part of the program. Many other programs and resources in provincial and federal governments, in universities and technical institutions can be tapped for advice and assistance by IRAP field workers. Through the Technology Inflow Program, IRAP can assist companies to import foreign technology.

Field Worker — The Heart of IRAP

The mainstay of the program is the field network and the Industrial Technology Advisor (ITA) who works out of the various offices. Ever since its conception the IRAP program has concentrated on making access to its services easy and understandable. ITAs call upon companies to ensure they are aware of the various aspects of the program and to enable the ITA to become acquainted with the company operations. Later, if the company requests assistance, the ITA has enough background knowledge of the company to deliver the most helpful response. The company usually is in the manufacturing, processing or construction sectors but could be from other sectors, such as the service industry.

The funding programs accessible through IRAP Field Service include:

H - a program in which a company is assisted to hire a student to tackle a technical problem;

L - a program in which a consultant or laboratory service can be used to provide an answer to a particular problem a company is having;

M - for the longer term, a program that provides support for in-house research; and

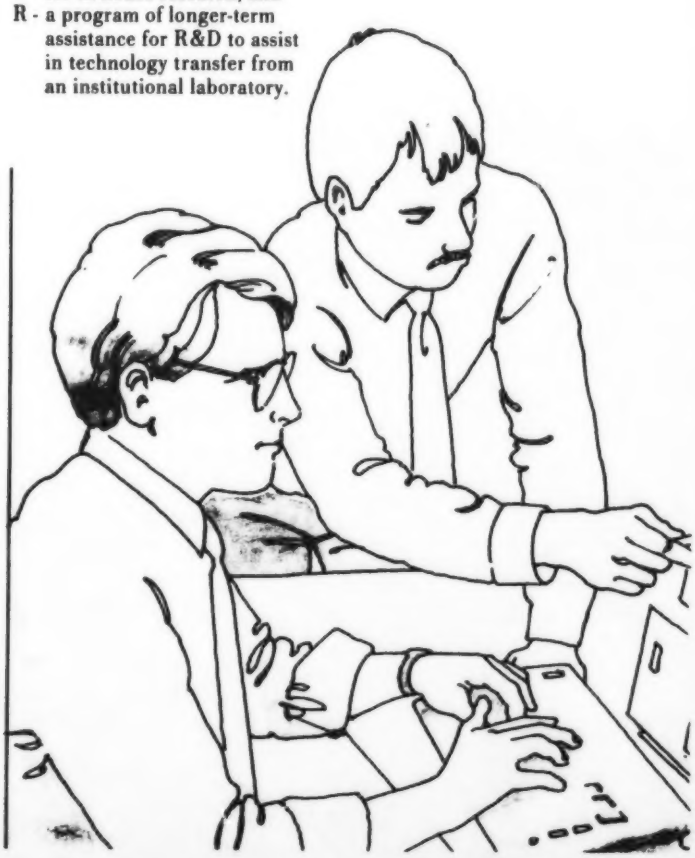
R - a program of longer-term assistance for R&D to assist in technology transfer from an institutional laboratory.

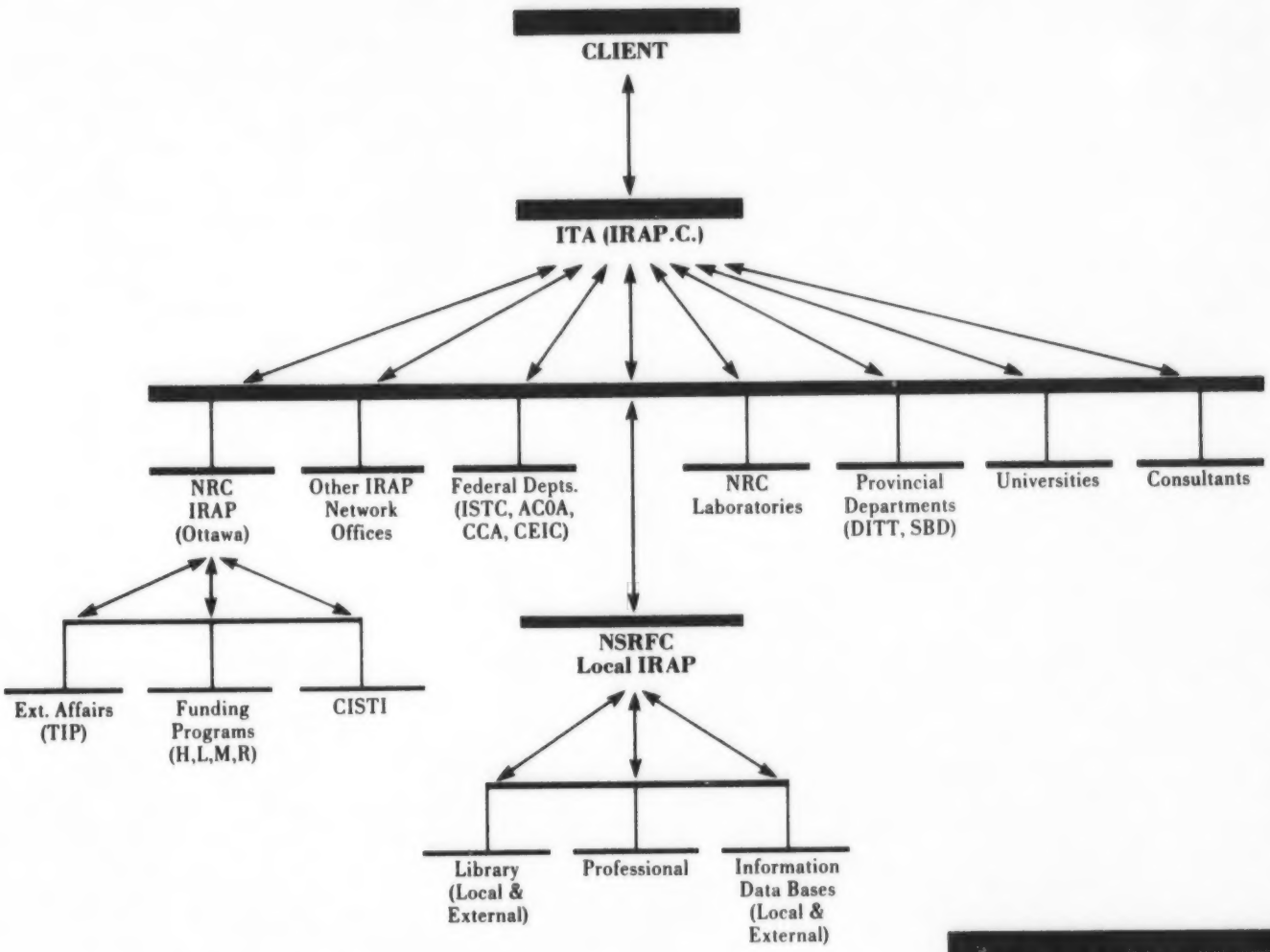
The Field Service and the IRAP program have a long history of assistance to Nova Scotia industry, and the Research Foundation has been an active supporter of this program for many years. IRAP participation is one of NSRFC's proudest achievements.

Regardless of our successes, technological advancement does not cease and let us rest. IRAP services will stay abreast of the times and help advance Nova Scotia industry. For a Nova Scotia company, this program is only as far away as the telephone. You will find us under Technology in the Yellow Pages.

MISSION: NSRFC

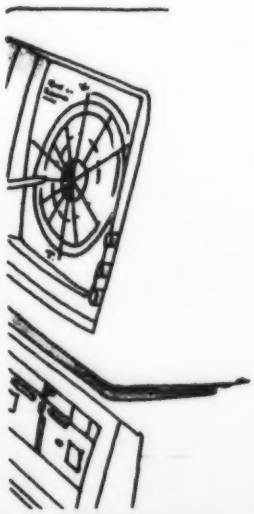
To promote, stimulate and encourage the effective use of science and technology in industry and government thereby assisting the economic development in Nova Scotia.





MISSION: IRAP

"To the extent the technology is needed, our mission is to help the Canadian firm be more competitive in its markets."



Affiliates

National Research Council Canada (NRC)

Our long-standing association with NRC is described in the centre spread.

Atlantic Farm Mechanization Institute

The Atlantic Farm Mechanization Institute (AFMI) was created as a non-profit corporation in 1985 to carry out research, development and testing of agricultural and woodlot machinery in and for Atlantic Canada.

The Institute is administered by a Board of Directors made up of farmers, extension agricultural engineers and representatives of the farm machinery industry. Created in the form of an "institute without walls" AFMI carries out its activities by drawing together expertise and resources presently existing in various institutions and firms within the region.

Managed by the Nova Scotia Research Foundation Corporation under the direction of the Institute's Board of Directors, the Institute carries out specific projects on a contract basis for individual clients and agencies.

Projects completed during the year included development of a portable fiddlehead cleaning system, evaluation of straw spreaders for blueberry mulching and confidential performance testing of a prototype mower-conditioner on behalf of a major farm machinery manufacturer.

Atlantic Instiute of Biotechnology

The Atlantic Institute of Biotechnology (AIB) was incorporated in 1985 as an independent non-profit research institute under the sponsorship of Dalhousie University, the Technical University of Nova Scotia, the Nova Scotia Research Foundation Corporation and the Nova Scotia Agricultural College. Five year funding was provided by DRIE.

AIB's objective is to promote and coordinate cooperation among the public and private sectors doing biotechnological research and thereby to create opportunities for commercial biotechnology.

AIB provides scientific and technical assistance to industrially oriented R&D. Projects may be carried out within the company or, where required, access can be arranged to facilities and expertise of research organizations and universities in the region.

During the past year the Institute has been involved in a wide range of projects including the micropropagation of plants, aquaculture of scallops and hybridoma research related to the development of diagnostics.

Applied Microelectronics Institute

Founded jointly in 1981 by NSRFC, Dalhousie University and the Technical University of Nova Scotia, the Applied Microelectronics Institute (AMI) is maintaining a position of leadership in the area of advanced electronic systems.

Revenues in the fiscal year 1988/89 increased to over $1.4 million. Contract engineering accounted for 80% of revenues. Specific projects involved a range of applications in high performance real time systems. Several projects included interaction and collaboration with the Nova Scotia Research Foundation Corporation. New capabilities being introduced in the coming year consist of design tools for Application Specific Integrated Circuits to enhance the competitiveness of new products being developed.

Small Business Technology Centre

The Small Business Technology Centre (SBTC), a full service incubator supporting technology-based start-up, is an exciting new element in Nova Scotia's economic development strategy.

SBTC environment and location, next to the Nova Scotia Research Foundation Corporation, not only provides a vehicle for technology transfer, but also creates an atmosphere for unequalled opportunity and accelerated growth.

Officially opened for less than two years, SBTC is currently home to over twenty growing companies, with approximately seventy-five employees.

Papers, Publications and Patents

Bennett, A.; Jonasson, K.A.; Thayer, W.L.; Stover, N.S.H.; Thambimuthu, K.V. "The NRC Oil-CSF Atomizer", presented at the 13th International Conference on Coal and Slurry Technology, April 12-15, 1988, Denver, Colorado, U.S.A.

Boyle, C.D. "Physiological Differentiation of Flooded N_2-Fixing Grass-Diazotroph Associations from Non-Flooded, Non-N_2-Fixing Ones." Soil Biol. Biochem. Vol. 20, No.6, pp. 902-913, 1988.

Howells, K.; McKay, A.G. "Seismic Profiling Investigation of a Small Area North of Sable Island, Scotian Shelf", Poster Display at the Atlantic Geoscience Society Annual Meeting, Amherst, Nova Scotia, February 1989.

Kazi, H.A.; Lutwick, G.D. "The Production of Unisize Submicron Particles by a Novel Process", presented at the Canadian Advanced Industial Materials Forum held February 23-24, 1989, Toronto, Ontario, Canada.

Lutwick, G.D.; MacAulay, J.D. Awarded U.S. Patent No. 4.806.019 for "Method and Apparatus for Mixing Two or More Components Such as Immiscible Liquids" (Rights assigned to NSRFC).

Robertson, W.J.; Boyle, C.D.; Brown, H.L. "Endomycorrhizal Status of Certified Strawberry Nursery Stock", J. Amer. Soc. Hort. Sci., Vol. 113, No. 4, pp. 525-529, 1988.

Sibley, K.J.; MacAulay, J.D., Brown, G. "Performance and Costs of Eight Straw Spreaders in Lowbush Blueberry Fields", presented at the Atlantic Committee on Agricultural Engineering Annual Workshop, Truro, Nova Scotia, February 1989.

Starzomski, J.J.; Jay, D.M. "Technical and Economic Evaluation of Two-Stage Direct Liquefaction Applied to Nova Scotia Coal", report under the Canada-Nova Scotia Agreement on Oil Substitution and Conservation, March 1989.

Archibald, G.
Member of Alumni Executive, Technical University of Nova Scotia

Member, Association of Professional Engineers of Nova Scotia — Finance Committee

Member, "Technology for Profit & Survival" Conference (October 1989), Steering Committee

Betancourt, T.
Mentor for the Engineers-In-Training for the Association of Professional Engineers of Nova Scotia

Bidgood, D.E.T.
Vice-President, Nova Scotia Institute of Science

Member, Energy Sector of Voluntary Planning

Edmonds, T.
Member of the N.S./P.E.I. Chapter of the Canadian Construction Research Board

Glass, I.W.
Committee Member, Association of Professional Engineers of Nova Scotia — "Placement Counselling Program"

Hellenbrand, K.
Member of the Board of the Atlantic Institute of Biotechnology

Member of the Dartmouth Lakes Advisory Board

Helliwell, J.
Member of the Economic Development Committee of the Halifax Board of Trade

Council Member of the Nova Scotia Institute of Science

Howells, K.
Treasurer, Geological Association of Canada/Mineralogical Association of Canada (GAC/MAC) 1992

Councillor, Atlantic Geoscience Society

Member, Nova Scotia Remote Sensing Committee

Jay, D.M.
President of the Nova Scotia Chapter of "WISE" — Women in Science and Engineering

Kazi, H. A.
Appointed Adjunct Professor at the Technical University of Nova Scotia

Special Lecturer at the Technical University of Nova Scotia

Appointed to TUNS Advisory Board for Ph.D. Candidates in Metallurgy

Member of Organizing Committee for the Canadian Institute of Mining and Metallurgy's 28th Annual Conference (August 1989)

Nickerson, T.B.
Vice-President of the Association of Provincial Research Organizations of Canada Inc.

Chairman of the Applied Microelectronics Institute

Vice-Chairman of the Nova Scotia Council of Applied Science and Technology

Selection Committee Member of the Ernest C. Manning Awards Foundation

Chairman of the "InnovatioNS" Newsletter

Chairman of the Board of Directors of the Discovery Centre

Chairman, "Technology for Profit & Survival" Conference (October 1989)

Board Member, Acadia Institute

MacAulay, J.D.
Council Member and Chairman of the Research and Education Committee of the Nova Scotia Institute of Agrologists

Member of Board of Governors of the Agricultural Institute of Canada Research Foundation and its Research Priorities Committee

Member of the Expert Committee on Mechanization of the Canada Committee on Engineering Services in Agriculture and Food

Member of Atlantic Committee on Agricultural Engineering Advisory Committee on Agricultural Power and Machinery

Mentor for Engineers-In-Training for the Association of Professional Engineers of Nova Scotia

MacNeill, R.
Council Member of the Dartmouth Chamber of Commerce. Chairman of Dartmouth City Beautification Awards Committee

Marshall, J.
Member of the Offshore Trade Association of Nova Scotia Program Committee

McKay, A.
Treasurer, IEEE Oceanic Engineering Society, Nova Scotia Chapter

Vice-Chairman, Dartmouth City Recreation Advisory Board

Osborne, J.
Secretary of IEEE Oceanic Engineering Society, Canadian Atlantic Chapter

Roberts, R.
Member of Board of Directors, Haltrans Industries (occupational training)

Officer, Naval Reserve

Simmons, R.
Executive Member, Canadian Institute of Food Science and Technology (Nova Scotia Chapter)

Member, Advisory Committee on Food Processing and Engineering

Professional Member, Nova Scotia Institute of Agrology

Starzomski, J.J.
Nova Scotia Representative on Canada-Japan Coal Liquefaction Working Group

Stover, N.S.
Mentor for Engineers-In-Training for the Association of Professional Engineers of Nova Scotia

Sutherland, F.
Executive Board Member, the Human Resource Development Association (HRDA)

Special Lecturer and an Undergraduate Thesis Supervisor at the Technical University of Nova Scotia

Mentor for Engineers-In-Training for the Association of Professional Engineers of Nova Scotia

Member, Nova Scotia Technology Committee for the Canadian Manufacturers Association

Member of Technology Committee, Voluntary Economic Planning

Member of the Technology Issue Group of the Committee working on the new Economic Strategy for Nova Scotia

Thorpe, J.W.
Laboratory services/consulting representative to the Dartmouth Community Awareness and Emergency Response (CAER) Organization, January 1989

Tyner, C.R.
Chairman of the Canadian Maritime Section of the Marine Technology Society

Williams, L.M.
Member of the N.S./P.E.I. Chapter of the Canadian Construction Research Board

Member of the Technical Committee of the Canadian Homebuilders Association of Nova Scotia

Member, APENS Consulting Practise Committee

AUDITOR'S REPORT

To the Chairman and Members of the
Board of Directors of the
Nova Scotia Research Foundation Corporation

I have examined the balance sheet of the Nova Scotia Research Foundation Corporation as at March 31, 1989 and the statements of revenues and expenses and retained earnings for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Corporation as at March 31, 1989 and the results of its operations for the year then ended in accordance with the accounting policies stated in Note 2 to the financial statements, applied, except for the change in accounting for inventory costs as explained in Note 3, on a basis consistent with that of the preceding year.

O.P. Cormier, F.C.A.
Auditor General
Halifax, Nova Scotia
May 26, 1989

Balance Sheet
As at Mach 31, 1989

Assets	**1989**	1988
Current		
Cash and short term investments	**$ 1,531,975**	$ 876,662
Accounts receivable	**1,432,968**	1,201,863
Inventory (Note 3)	**121,541**	215,949
Work in progress	**50,508**	539,468
	3,136,992	2,833,942
Investments and Funds (Note 4)		
Research Endowment Fund	**1,000,000**	1,000,000
Nova Scotia First Fund	**10,000,000**	-
Other investments	**13**	-
	11,000,013	1,000,000
Fixed		
Land and buildings	**2,843,267**	2,843,267
Equipment	**1,920,997**	1,655,379
	4,764,264	4,498,646
	$18,901,269	$8,332,588

Liabilities and Equity	**1989**	1988
Current		
Accounts payable		
Trade	**$ 271,506**	$ 343,980
Province of Nova Scotia	**2,130,886**	1,908,407
Deferred revenue	**244,442**	92,604
	2,646,834	2,344,991
Fund Balances		
Research Endowment Fund	**1,000,000**	1,000,000
Nova Scotia First Fund	**10,000,000**	-
	11,000,000	1,000,000
Equity		
Contributed surplus	**4,764,264**	4,498,646
Retained earnings	**490,171**	488,951
	5,254,435	4,987,597
	$18,901,269	$8,332,588

Loan Guarantees (Note 5)

Statement of Retained Earnings
For the Year Ended March 31, 1989

	1989	1988
Balance, beginning of year	$488,951	$475,820
Add: Net income	1,220	13,131
Balance, end of year	$490,171	$488,951

Statement of Revenues and Expenses
For the Year Ended March 31, 1989

	1989	1988
Revenues		
Contracts (Note 6)	$4,158,092	$4,001,610
Grant from Province of Nova Scotia	2,582,500	2,516,900
	6,740,592	6,518,510
Expenses		
Scientific and engineering	5,483,320	5,350,574
Administrative and occupancy	1,564,143	1,322,881
	7,047,963	6,673,455
Operating Loss Before Investment Income	307,371	154,945
Investment Income		
Research Endowment Fund	102,540	91,286
Short term investments	206,051	76,790
	308,591	168,076
Net Income	$ 1,220	$ 13,131

Notes to the Financial Statements
March 31, 1989

1. **Authority**
The Nova Scotia Research Foundation Corporation was established in 1975 by the Act to Establish the Nova Scotia Research Foundation Corporation. Its purpose is to assist in the economic development of Nova Scotia by promoting, stimulating and encouraging the effective utilization of science and technology by industry and government.

2. **Accounting Policies**
These financial statements have been prepared in accordance with generally accepted accounting principles modified by the Corporation's accounting treatment of fixed assets described in (c) below.
   a) *Short term investments:* Short term investments are valued at the lower of cost or net realizable value.
   b) *Inventory and work in progress:* Inventory and work in progress is valued at the lower of cost or net realizable value.
   c) *Fixed assets and contributed surplus:* Fixed assets are acquired by purchase, donation or construction. The costs of purchased capital additions and the fair market values of donated capital additions are recorded as fixed assets with an offsetting credit to contributed surplus. When fixed assets are constructed by the Corporation, the related materials labor and overhead costs are included as fixed assets in the year of expenditure. When fixed assets are acquired out of the general revenues of the Corporation, they are charged to expenses in the year of acquisition. When the costs of equipment have been carried on the Corporation's financial statements for ten years, that cost is removed from both the fixed asset and contributed surplus accounts.
   d) *Government assistance:* Funds received for the acquisition of equipment are offset against the cost of this equipment. Funds received for operating expenses incurred are recorded as revenue in the same year as the expenses were incurred.

3. **Inventory**
Inventory manufactured by the Corporation includes an allocation of overhead costs of $22,252. This represents a departure from the basis of valuation used in prior years. This change has not been applied retroactively and comparative figures have not been restated.

4. **Funds and Investments**
Research Endowment Fund — Subject to any directions provided by the Governor in Council, the Fund is administered and controlled by the Corporation. The Fund is invested in a Province of Nova Scotia 11.125% promissory note which will mature November 17, 1989.
Nova Scotia First Fund — On March 30, 1989 the Governor in Council approved an appropriation in the amount of $10,000,000 to establish the Nova Scotia First Fund. The objective of the Fund is to encourage the development of high technology industries and the adaptation of new technologies in existing industries. The Corporation is in the process of appointing a committee to manage the Fund and formulating terms of reference. At March 31, 1989 the Fund was invested in guaranteed investment certificates earning interest at an annual rate of 12.15% and maturing on May 30, 1989.
Other Investments — Other investments consist of a 20% ownership of Pathfinder Med Limited at a stated cost of $10, and 100% ownership of Nova Magnetics Limited at a stated cost of $3. Nova Magnetics Limited ceased active operations on April 1, 1987. Management has decided that effective for the current fiscal year the financial statements of Nova Magnetics Limited will no longer be consolidated with those of the Corporation. This change has not been applied retroactively and comparative figures have not been restated.

5. **Loan Guarantees**
The Corporation has provided a total guarantee of $50,000 to the Royal Bank of Canada as security for a loan and line of credit from the bank to the Applied Microelectronics Institute.

6. **Government Assistance**
Contract revenues include government assistance of $129,172 for expenses incurred under various federal and provincial agreements.

7. **Reclassification of Prior Year's Figures**
Certain of the prior year's figures have been reclassified to conform to the current year's presentation.

Organization Chart

Board of Directors

President & Chairman of the Board
T.B. Nickerson

University Liaison Director
F.A. Sutherland

Applied Science Vice-President
D.E.T. Bidgood

- **Laboratory Services**
  Director, J.W. Thorpe
- **Research & Development**
  Director, J.J. Starzomski

Industry Services Vice-President
J.R. Helliwell

- **Field Service**
  Director, G.R. Archibald
- **Project Services**
  Director, J.D. MacAulay
- **Library**
  Librarian, H.I. Hendry
- **Technical People In Industry**
  Manager, I.W. Glass

Product Development Vice-President
C.R. Tyner

- **Engineering**
  N.P. Richter
- **Manufacturing**
  Director, C.E. Isenor
- **Marketing**
  Director, D.S. Rankin
- **Services**
  W.A. Mills
- **Quality Control**
  H.G. James

Finance & Administration Vice-President
R.F. MacNeill

- **Accounting**
  Controller, C.J. Baxter
- **Purchasing**
  Manager, W.G. LeRue
- **Personnel**
  B.J. Oldfield
- **Building Services**
  Manager, G.E. Fraser

Board of Directors

As At March 31, 1989

* **Mr. T.B. Nickerson, P. Eng.**
Chairman of the Board
President
Nova Scotia Research Foundation Corporation
Dartmouth, NS

Dr. J.E. Blanchard
Halifax, NS

Mr. J.C. Callaghan
Halifax, NS

* **Mr. M. A. Eisenhauer**
President
ABCO Limited
Lunenburg, NS

* **Mr. P. Ferguson**
Operations Manager
Distribution/Atlantic
ESSO Petroleum Canada
Dartmouth, NS

Mr. D.H. McKeough
New Glasgow, NS

Dr. J.D. McNiven
Dean, Faculty of Management Studies
Dalhousie University
Halifax, NS

Mr. T.G. Merriam
Deputy Minister
N.S. Department of Industry, Trade & Technology
Halifax, NS

* **Mr. W.O. Morrow**
Chairman of the Board
National Sea Products Limited
Halifax, NS

Dr. W.S. Shaw
Chairman, Geology Department
St. Francis Xavier University
Antigonish, NS

Mr. J.E. Terry
Vice-President, Community Services
University College of Cape Breton
Sydney, NS

Mr. R.F. MacNeill
Secretary, Board of Directors
Nova Scotia Research Foundation Corporation
Dartmouth, NS

* Members of the Executive Committee of the Board of Directors

STAFF

As At March 31, 1989

PRESIDENT'S OFFICE

President
T.B. Nickerson, B.Eng., M.Sc., P.Eng.

Secretary
N.J. Gerogiannis

University Liaison
F.A. Sutherland, B.Eng., M.Eng., P.Eng.

FINANCE & ADMINISTRATION

Vice-President, Finance & Administration
R.F. MacNeill, B.Sc., B.Comm.

Personnel Administrator
B.J. Oldfield

Accounting
C.J. Baxter, B.Comm., C.A.
E.P. Arsenault, B.Eng., P.Eng.
R. Chaffey
M.L. Creamer
J.P. Leger

Purchasing
W.G. LeRue
J.M. Foster
E.P. Kelly

Receptionist
J.D. Steeves

Building Services
G.E. Fraser, Dip. Mach.
J.F. Brown
P.S. Mugridge, Elect. Tech.
H.J. Parusel, Auto. Tech.
R.A. Reid
B.S. Gandhu
J.S. Benjamin
G.E. Dean
F.G. Walsh
J.A. Weatherup
D.G. Young

Innovation and Design
P.M. Taiani

APPLIED SCIENCE

Vice-President, Applied Science
D.E.T. Bidgood, B.A., M.A., Ph.D

Secretarial
J.M. Colpitts
C.A. MacDonald

Analytical and Environmental Chemistry
J.W. Thorpe, B.Sc., M.Sc., Ph.D., M.B.A.
M.J. Firth
W.E. Dearman, B.Sc.
B.P. Boudreau, Chem. Tech.
G.G. Fraser, Chem. Tech.
H.F. Irving, Chem Tech.
M.J. MacGillivray, Chem. Tech.
P.C. Malley, Chem. Tech.
R.G. Mombourquette
S.G. Thomas, Chem. Tech.

Biology
K.E. Hellenbrand, Ph.D.
A.E. Reade, B.Tech., Ph.D.
R.L. Cervelli, B.Sc., M.Sc.
H.L. Brown, B.Sc.
K.L. Viet, Bio. Tech.
E. Sheppard, Bio. Tech.

Coal and Mineral Technology
J.J. Starzomski, B.Sc.
D.M. Jay, B.Sc., P.Eng.
G.D. Lutwick, B.Sc., M.Sc., Ph.D.
N.S. Stover, B.Sc., M.Sc., P.Eng.
G.R. Johnson, B.Sc.
L.D. Giffin, B.Sc.
D.B. Keeler
M.A. Crowell, B.Sc.
R.E. Skinner, B.Sc.
R.W. Tizzard, B.Sc.
K.G. MacDonald, B.Sc.

Geophysics
K. Howells, B.Sc., Ph.D.
A.G. McKay, B.Sc., M.Sc., Ph.D.
D.D. Prentiss, B.Sc., P.Eng.
D.E. Clarke, Building Tech.
R.J. Harris
F.M. Smith, Ag. Tech.

INDUSTRY SERVICES

Vice-President, Industry Services
J.R. Helliwell, A.C.S.M., P.Eng.

Secretarial
C.L. O'Connell
G.P. Woodgate

Field Service — IRAP
G.R. Archiblald, B.Eng. P.Eng.
J.P. Archibald, B.Sc., B.Eng., P.Eng.
T.K. Edmonds, B.Sc., B.Eng., P.Eng.
I.W. Glass, B.Sc., P.Eng.
J.J. Marshall, B.Eng., P.Eng.
D.W. Martell, B.Eng., P.Eng.
R.D. Simmons, B.Sc. Agr.
J.D. Stacey, B.Eng., P.Eng.
M.W. Veling, B.Sc.
L.M. Williams, B.Eng., P.Eng.

Project Services
J.D. MacAulay, B.S.A., M.Sc., Ph.D., P.Ag., P.Eng.
I.L. Hawboldt, B.Sc., M.Sc.
R.F. Jones, B.Eng., P.Eng.
R.L. Roberts, B.Sc., M.B.A.
K.J. Sibley, B.Sc. (Agr.Eng.), M.Sc., P.Eng.
S.L. Lorimer
R. Maxwell, Glassblowing Tech.

Materials
T.K. Betancourt, B.Eng., M.Eng., P.Eng.
H.A. Kazi, B.Sc.Eng., M.Eng., Ph.D., P.Eng.
J.S. MacIntyre, B.Eng.
M.L. Robicheau, B.Sc., M.Ap.Sc.
W.R. Gillis, B.Sc.
H.B. Stillman, B.Sc.

Library
H.I. Hendry, B.A., B.Lib.Sc.
J.F. Fitch, B.S.A.
M.C. MacDonald, B.A.

PRODUCT DEVELOPMENT

Vice-President, Product Development
C.R. Tyner, H.N.C., P.Eng.

Secretary
S.M. Williams

Engineering
N.P. Richter, B.Eng., P.Eng.
E.A. Smallhorn, B.Eng., P.Eng.
J.B. Oliver, B.Sc.
A.J. Hines, Elect. Tech.

Electronics
J.T. Osborne, B.Sc., A.R.C.S., P.Eng.
C.A. Butler
R.G. Morash, B.Sc.

Drawing Office
W.A. Mills, Electromech, Draft.
J. Edwards
N. McFeters

Manufacturing
C.E. Isenor, Dip.Mach.
A.B. Johnson, Dip.Mach.
R.J. Conrod, Dip.Mach.
L.R. Hartlen, Dip.Mach.
R.A. Marks, Dip.Mach.
M.A. Wright, Dip.Mach.
D.K. Julien, Ind.Elect.
H. Porteous, Mech.Tech.

Marketing
D.S. Rankin, B.Sc., Ph.D.

Quality Control
H.G. James, Mech.Draft.